

Remarks

The present invention is directed to coating compositions containing prepolymers bearing reactive $-X-CH_2-Si(OR)_{3-x}R'_x$ groups prepared by reacting certain silanes with a prepolymer precursor reactive therewith. It has been surprisingly discovered that such silane-terminated prepolymers exhibit severely increased curing rates as compared to otherwise similar polymers wherein the methylene group is replaced by an ethylene, n-propylene, isopropylene, n-butylene, or 2-butylene group.

In the past, alkoxysilyl groups have been introduced into prepolymers through the use of compounds such as vinylalkoxysilanes, alkylalkoxysilanes, aminopropylalkoxysilanes, and the like. These reactions introduce silyl groups separated from prepolymer precursor reactive functionality by a propylene or ethylene group. While curable at elevated temperatures, the prepolymers exhibit only relatively slow curing rates at temperatures at which many coatings are cured, e.g. room temperature to 80°C. Moreover, the reactivity is slow enough that it is not possible to employ ethoxysilyl groups which would be more desirable ecologically and for toxicity reasons. Only methoxysilanes possessed suitable reactivity, but even the generally required metal catalysts, especially tin catalysts, which are also not desirable ecologically.

Applicants have found that substitution of reactive silanes by those having only a methylene group between the alkoxysilyl group and an electronegative atom or group, results in alkoxysilyl groups which are highly reactive, even allowing ethoxysilyl groups to be used, and preferably also avoiding the use of any catalyst. These products are so sensitive to moisture that they cannot be prepared as aqueous dispersions, which is not the case with otherwise similar propyl-spaced products.

Claim 11 has been added to recite that the claimed prepolymers are prepared by reacting at least one silane selected from formulae 7, 8, and 9 on page 11 of the specification,

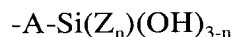
and that the prepolymers are neat (solvent free) or dissolved in organic solvent, support for which may be found on pages 17 and 18 of the specification.

New claims 25 requires the “base” polymer, i.e. the prepolymer precursor, to be selected from the enumerated polymers disclosed on page 10, lines 13 - 18.

New claim 26 is similar to claim 11, but specifies that the reactive silanes are those of formulae 8 and 9 of page 11. Claim 28 requires the base polymer to be a hydroxyl-functional polyurethane prepolymer, as used in the Examples and on page 12. Claim 30 requires that heavy metal catalysts are not present, support for which may be found on page 5. No new matter is introduced by virtue of these amendments.

The second rejection will be discussed first.

Claims 11, 12, 17 - 19, 20 , 22 and 24 have been rejected under 35 U.S.C. § 102(b) or §103(a) over Majolo et al. WO 2000/35918 (“*Majolo*”). *Majolo* discloses aqueous dispersions of polymers containing at least one group of the formula



where $n=0, 1$, or 2 , (col. 2, lines 25 - 40) i.e. the polymer must contain at least one silicon-bound hydroxyl group; A is a hydrocarbon selected from the numerous categories of col. 2, lines 31 - 37; and Z is methyl, methoxy, or alkyl or alkoxy groups as disclosed in lines 37 - 40.

The silyl groups required by Applicants contain no Si-OH groups as do those of *Majolo*. Moreover, the products of *Majolo* are aqueous dispersions. Applicants claims are directed to neat polymers or solvent-borne systems. Applicants rapid moisture-curing systems cannot be formulated as an aqueous dispersion, because the methylene-spaced products simply are far too reactive and would polymerize or gel if water were present.

It is clear that *Majolo* never prepared any product containing a methylene “spacer” between the alkoxysilyl group and an electronegative group, because if he had done so, he could not have obtained an aqueous dispersion of the polymers. Rather, they would have immediately reacted upon contacting water. *Majolo* was clearly unaware of the benefits of selecting a methylene spacer, and has not contributed any knowledge of its highly and unusual characteristics to the skilled artisan. *Majolo* fails to render the claimed invention obvious for this reason alone, and fails also to anticipate since he only discloses aqueous dispersions. Finally, he does not disclose, teach or suggest the use of alkoxysilyl or alkylalkoxy silyl groups. All his silyl groups contain at least one hydroxyl functionality.

Withdrawal of the rejections of the claims over *Majolo* is solicited.

Claims 15, 16 have been rejected over *Majolo* under 35 U.S.C. § 103(a). the rejection of these claims is traversed for the same reasons as here-to-fore presented: *Majolo* does not disclose, teach, or suggest anything but aqueous dispersions.

Claims 11 - 14, 17 - 21, and 24 have been rejected over *Sakagami* under 35 U.S.C. § 102(b) or §103(a).

The Office has cited the MPEP which refers to *In re Schauman*, 197 USPQ 5 (CCPA 1978). The position of the Office is that since *Sakagami* refers to only four linking groups (actually, 6 - include 2-propylene and 2-butylene as well), that the generic formula serves as an anticipatory disclosure. *Schauman* is certainly a relevant case. However, as *Schauman* indicates, this anticipatory generic disclosure is premised on “a limited number of compounds closely related to each other in structure and the properties possessed”

It is well recognized in Patent Law that patentability may be found, even with regard to a limited genus, when members of that genus display properties completely disparate from the remaining members of the genus, and the use of the particular species or specie is/are not exemplified. In pharmaceuticals, for example, replacing methyl or propyl by ethyl is

considered *prima facie* anticipated or obvious, and yet pharmaceutical compounds with just such a substitution have been found patentable when they exert unusual pharmaceutical effects in comparison with their homologs.

Here, there is a significant and profound difference between a methylene spacer and the more commonly used propylene spacers. This distinction is not disclosed by *Sakagami*, who employed ethylene and propylene spacers, but no methylene spacer. *Sakagami* neither disclosed nor suggested the advantageous properties of such compounds to the skilled artisan.


Moreover, such methylene-spaced compounds could not have even survived the procedure employed by *Sakagami* in Examples 1 - 5 and comparative Examples 1 - 9, because 30 parts of water are added. The reactivity of methylene-spaced alkoxy silyl groups with water is so great that they react many times faster than ordinary alkoxysilanes such as dimethyldimethoxy silane, and as a result, the silyl groups on *Sakagami*'s polymer, were it to have a methylene spacer, would react prematurely and would no longer be able to crosslink and cure - it would already be cured.

Sakagami also discloses neither of the second or third silanes of the claims, and also fails to disclose polymers such as polyurethanes. Withdrawal of the rejection of the claims over *Sakagami* is solicited.

Applicants submit that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion will advance the prosecution of the Application, the Examiner is highly encouraged to telephone Applicants' attorney at the number given below.

Respectfully submitted,

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